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Docket Nos.: 50-364

NL-14-1825

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant – Unit 2  
Licensee Event Report 2014-002-00  
Manual Reactor Trip due to Loss of 2B Startup  
Auxiliary Transformer and Loss of Offsite Power

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv)(A) Southern Nuclear Company hereby submits the enclosed Licensee Event Report, "Manual Reactor Trip due to Loss of 2B Startup Auxiliary Transformer and Loss of Offsite Power."

This letter contains no NRC commitments. If you have any questions regarding the submittal, please contact Ms. Julie Collier at (334) 814-4639.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Gayheart", is written over a horizontal line.

Ms. C. A. Gayheart  
Vice President – Farley

CAG/JAC

Enclosure: Unit 2 Licensee Event Report 2014-002-00

cc: Southern Nuclear Operating Company  
Mr. S. E. Kuczynski, Chairman, President & CEO  
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer  
Mr. M. D. Meier, Vice President – Regulatory Affairs  
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U. S. Nuclear Regulatory Commission  
Mr. V. M. McCree, Regional Administrator  
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Mr. K. E. Miller, Resident Inspector – Farley

Joseph M. Farley Nuclear Plant – Unit 2

NL-14-1825

Manual Reactor Trip due to Loss of 2B Startup Auxiliary Transformer and Loss of  
Offsite Power

Enclosure

Unit 2 Licensee Event Report 2014-002-00



## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 60 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimates to the FOIA, Privacy and Information Collections Branch (T-6 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to [InfoCollections.Resource@nrc.gov](mailto:InfoCollections.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NE-08-10302, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME Joseph M. Farley Nuclear Plant, Unit 2	2. DOCKET NUMBER 05000 364	3. PAGE Page 1 of 4
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4. TITLE Manual Reactor Trip due to Loss of 2B Startup Auxiliary Transformer and Loss of Offsite Power
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5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	14	2014	2014	- 002	- 00	12	12	2014	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(I)	<input type="checkbox"/> 50.73(a)(2)(I)(C)	<input type="checkbox"/> 50.73(a)(2)(VI)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(II)	<input type="checkbox"/> 50.73(a)(2)(II)(A)	<input type="checkbox"/> 50.73(a)(2)(VII)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(II)(B)	<input type="checkbox"/> 50.73(a)(2)(VII)(B)
	<input type="checkbox"/> 20.2203(a)(2)(I)	<input type="checkbox"/> 50.36(c)(1)(I)(A)	<input type="checkbox"/> 50.73(a)(2)(III)	<input type="checkbox"/> 50.73(a)(2)(IX)(A)
10. POWER LEVEL  82	<input type="checkbox"/> 20.2203(a)(2)(II)	<input type="checkbox"/> 50.36(c)(1)(II)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(IV)(A)	<input type="checkbox"/> 50.73(a)(2)(X)
	<input type="checkbox"/> 20.2203(a)(2)(III)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(V)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(IV)	<input type="checkbox"/> 50.46(a)(3)(II)	<input type="checkbox"/> 50.73(a)(2)(V)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(V)	<input type="checkbox"/> 50.73(a)(2)(I)(A)	<input type="checkbox"/> 50.73(a)(2)(V)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(VI)	<input type="checkbox"/> 50.73(a)(2)(I)(B)	<input type="checkbox"/> 50.73(a)(2)(V)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER	
LICENSEE CONTACT Julie A. Collier - Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (334) 814-4639

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
A	FK	50	A500	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On 10/14/14 at 0341 CDT, Unit 2 reactor was manually tripped after a lightning strike in the High Voltage Switchyard (HVSy) led to a phase 3 to ground fault on a 500kV transmission line resulting in a B train Loss of Site Power (LOSP). The fault caused the 2B Startup Auxiliary Transformer (SAT) instantaneous overcurrent relay to actuate and resulted in de-energizing the 2B SAT. A missing nut in the Power Circuit Breaker (PCB) protection circuitry caused a high resistance on one side of the current transformer circuit resulting in an imbalance in current flows and an actuation in the primary differential instantaneous overcurrent relaying. The B train LOSP in conjunction with the 2B Emergency Diesel Generator (EDG) being out of service for a planned maintenance outage caused a loss of Component Cooling Water (CCW) to the Reactor Coolant Pumps (RCP). The Unit 2 Abnormal Operating Procedures for loss of CCW and loss of A or B Train Electrical Power were entered and the reactor was manually tripped and the RCPs were secured. The reactor trip is reportable per 10 CFR 50.73(a)(2)(iv)(A) for manual actuation of the reactor protection system. Additionally, the reactor trip resulted in a valid actuation of the Auxiliary Feedwater system which is reportable per 10 CFR 50.73(a)(2)(iv)(A).

Corrective actions include: installed the missing PCB current transformer (CT) nut; satisfactorily tested primary and secondary protective relaying for 2B SAT; and strengthening of switchyard standards of the utility performing the maintenance. Extent of Condition walkdowns were performed for other circuits in the HVSy and repaired as necessary.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to [InfoCollects.Resource@nrc.gov](mailto:InfoCollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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**NARRATIVE**

Westinghouse - Pressurized Water Reactor  
Energy Industry Identification Codes are identified in the text as [XX].

**Requirement for Report**

The reactor trip is reportable per 10 CFR 50.73(a)(2)(iv)(A) for manual actuation of the reactor protection system. Additionally, the reactor trip resulted in a valid actuation of the Auxiliary Feedwater system which is also reportable per 10 CFR 50.73(a)(2)(iv)(A).

**Unit Status at Time of Event**

Prior to the event Unit 2 was operating at 82 percent power and was in a power coast-down prior to a refueling outage.

**Description of Event**

On 10/14/14 at 0341 CDT, the Unit 2 reactor was manually tripped after a lightning strike in the HVSY led to a phase 3 to ground fault on a 500kV transmission line resulting in a B train Loss of Site Power (LOSP). The fault caused the 2B SAT instantaneous overcurrent relay to actuate and resulted in de-energizing the 2B Startup Auxiliary Transformer (SAT). A missing nut in the Power Circuit Breaker (PCB) protection circuitry caused a high resistance on one side of the current transformer circuit resulting in an imbalance in current flows and an actuation in the differential instantaneous overcurrent relaying. The B train LOSP in conjunction with the 2B Emergency Diesel Generator (EDG) being out of service for a planned maintenance outage caused a loss of Component Cooling Water (CCW) to the Reactor Coolant Pumps (RCPs). The Unit 2 Abnormal Operating Procedures for loss of CCW and loss of A or B Train Electrical Power were entered and the reactor was manually tripped and the RCPs were secured.

In February and March of 2013, High Voltage Switchyard (HVSY) PCB 944 and protective circuitry were installed as part of a Design Change Package (DCP) for upgrading the HVSY Bank 1 bus. This design change work was performed by Alabama Power Company (APCO) with oversight provided by Southern Nuclear Company (SNC) in accordance with approved oversight procedures. Testing was performed to verify correct installation of the current transformers (CT) for Power Circuit Breaker (PCB) 944 and the associated wiring. These tests included insulation resistance (Megger) testing of CT and cables, continuity checks of CT cables, verification of one ground per circuit, and polarity, ratio and saturation testing for CTs. All of these were satisfactory and the DCP was completed with no issues being identified.

Approximately 18 months after the DCP installation, a lightning strike on the Farley-Snowdown 500kV transmission line on 10/14/14, led to a phase 3 to ground fault on the Farley-Snowdown 500kV line. The Snowdown line relaying at Farley Transmission Substation operated as a result of the fault and tripped open HVSY PCBs 1112 and 1212. Although these PCBs tripped open, the phase 3 to ground fault did not clear due to a ground fault that was occurring internal to PCB 1112 on the bus side of the main contacts. The No.1 500kV bus secondary differential relaying operated as a result of continuation of the fault and tripped HVSY PCBs 1102 and 1132 which cleared the fault.

Prior to the bus fault being cleared, fault current was drawn from the 230kV side of the HVSY through HVSY PCBs 840 and 944. The fault current of over 3000 amps exposed a loose termination in phase 3 of



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## NARRATIVE

PCB 944's CT circuit when the fault current passed through PCBs 840 and 944. This loose connection created a point of high resistance in PCB 944's CT circuit which caused the 2B SAT instantaneous overcurrent relay to see a difference in the current contributions from PCBs 840 and 944, indicating a fault in the 2B SAT zone of protection and causing the instantaneous overcurrent relay to actuate.

The instantaneous overcurrent relay then tripped HVSY PCBs 840 and 944 resulting in isolation of the 2B SAT which caused a LOSP to the B train power bus. A higher than normal resistance was created by a loose termination in the PCB 944 CT circuit to the instantaneous overcurrent relay that was caused by omitting a 5/16 inch nut when installing PCB 944 protection circuitry.

At the time of the B train LOSP, the 2B EDG was tagged out of service for a planned maintenance outage for replacement of the governor. This caused the diesel to be unavailable to start as designed to pick up the B train loads after the loss of the 2B SAT. One of the loads lost on the B train was cooling water to the RCP thermal barriers and oil coolers. This led to entry into the Abnormal Operating Procedures for loss of CCW and loss of A or B Train Electrical Power, and manually tripping the reactor and securing the RCPs at 0341 CDT.

Unit 2 'B' train power was restored at 0523 CDT.

## Cause of Event

The direct cause of this event was the loose termination from a missing nut in the PCB 944 CT circuit connection to the instantaneous overcurrent relay, which in addition to the continued fault on the 500kV bus side of PCB 1112 led to the B train LOSP. The manual reactor trip resulted from the B train alignment of cooling water to the RCP thermal barriers and oil coolers.

The root cause was inadequate verification practices during APCO wiring installations that led to a nut not being installed on its terminal. A contributing cause to this event is not fully understanding the extent of the differences in verification practices performed by the organizations.

## Safety Assessment

All systems responded as designed to the reactor trip and the B train LOSP. The CCW miscellaneous header was aligned to A-Train, and the B RCP was restarted. The 2C diesel generator was manually started and was aligned to B train loads. All equipment operated as-designed to mitigate the event. There was no loss of safety function and no radioactive release associated with this event. There was no actual consequence detrimental to the health and safety of the public. During the event all A-Train safe shutdown equipment responded appropriately.

## Corrective Action

The missing nut was installed and secured for the PCB 944 current transformer. Primary and secondary protective relaying for the 2B SAT was tested satisfactorily. Extent of Condition walkdowns were performed for other circuits in the HVSY and repaired as necessary. To prevent recurrence SNC will work to strengthen standards of the utility performing the maintenance for work performed in the high voltage switchyard, ensuring that for this type of work expectations are communicated, and training and verification practices are strengthened.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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**NARRATIVE**

**Additional Information**

Farley Unit 1 and Unit 2 Licensee Event Reports for the previous five years have been reviewed. In 2013 Farley Unit 1 experienced an automatic reactor trip resulting from a loss of the startup auxiliary transformer. LER 2013-001-00 was submitted. That event was caused by a degraded piece of equipment (lightning arrestor) that, over a period of time, had moisture ingress that caused a fault. The failure of the equipment caused the 1B SAT to become de-energized resulting in a Unit 1 automatic reactor trip. The details and corrective actions for that event are not similar to this occurrence because it did not result from the human performance tool of inadequate verification practices.